

The Boundaries of Information Sharing and Integration: A Case Study in Taiwan E-Government

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ABSTRACT

The paper explores the various boundaries of cross-boundary information sharing and integration in the context of Taiwan e-Government by using an integrated framework of boundaries adopted from the literature. The discussion of the various boundaries provides a thorough lens to understand the complexity of cross-boundary information sharing and integration. The adopted framework of boundaries is proved to be a useful analytical tool to perceive various vertical and horizontal boundaries in the initiatives of cross-boundary information sharing and integration in different e-Government contexts. A new process boundary in the vertical dimension is also identified. In addition, centralized information systems in the case study can help to decrease boundaries. Lastly, it is also perceived that vertical boundaries are not always easier to cross than horizontal boundaries.

Categories and Subject Descriptors

H.4.2 [Information Systems Applications]: Type of Systems – e-Government Applications

General Terms

Management, Theory

Keywords

Information Sharing, Boundary, Electronic Government, Taiwan

1. INTRODUCTION

Electronic government (e-Government) has become an important strategy for attaining effectiveness and efficiency in government administrations and public services [1][2]. Researchers define e-

Government as the delivery of government services (information, interaction, and transaction) through the use of information and communication technologies [3]. During the e-Government development, cross-boundary information sharing and integration is important when critical information to run government operations are usually scattered around government agencies maintaining respective information systems [4]. The demand for cross-boundary information sharing and integration exists not only across different levels of government agencies (vertical dimension) but also among government agencies with different functionalities (horizontal dimension) [4]. With information sharing and integration, government agencies can act faster to identify problems and react with prompt responsiveness [5].

2. WHAT ARE THE BOUNDARIES

However, what are the “boundaries” in cross-boundary information sharing and integration? Zheng et al. [6] give the following distinction between “boundaries” and “barriers” in information sharing and integration: “Put simply, a boundary is a line we need or want to cross, and a barrier is what prevents us from crossing. The difficulty of crossing a specific boundary is determined by the existence of certain political, organizational and technological barriers around it...Barriers may therefore be overcome or eliminated with some efforts, but boundaries tend to exist for a long period of time unless significant institutional changes occur...” The following subsections talk about the boundaries of information sharing and integration discussed in the literature.

2.1 Organizational Boundary

Organizational boundary in information sharing and integration has been studied from both the vertical and horizontal dimensions. Vertical hierarchical structure can hinder information sharing and integration of organizational units residing in different levels [7]. Horizontal Departmentization can also impede information sharing among horizontal departments with different functionalities [8]. Due to the differences in expertise, experience, and regulations in different domains, organizational boundaries form among different organizations or departments [9][10]. It is also pointed out that organizational boundaries occur among government agencies due to the differences in their defined missions, utilized resources, organized capacities, assigned responsibilities, and respective accountabilities [11]. In the public

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sector, organizational boundaries are often the result of legislation creating certain departments or agencies and defining their missions [12][13].

2.2 Personal, Sectoral, and Geographic Boundaries

Personal boundaries also play an important role in information sharing and integration. Interpersonal relationships and interactions can influence attitudes and intentions to share information. Informal relationships such as personal networks that are not previously arranged and defined by hierarchy and regulation, can result in more intense and effective information sharing between departments of an organization [7][8]. In addition, there is a sectoral boundary existing between the public and the private sectors. Organizations in the public sector can own different origins, values, and cultures from those in the private sector [2][12]. Researchers suggest that governmental information sharing and integration should not be limited to the public sector only. Both the private and the non-profit sectors need to be included to provide more integrated services to the public [14]. Furthermore, geographic boundaries can exist in cross-boundary information sharing when government agencies are spread in various geographic locations. Geographic boundaries can incur factors such as different cultures and time zones that can cause challenge in collaboration work [9]. Distance between two geographic locations can also lead to inefficient communication, misunderstanding, and conflict [9].

2.3 Development Level and Process Boundaries

Zheng et al. [6][15] claim that when gaps exist in the levels of technological, managerial, personnel, and economic developments of the participating organizations, a development level boundary can occur. The concept is derived from the concept of the digital divide while focusing on the capabilities of involved organizations, rather than individuals. It is observed that information sharing initiatives seem to work better in organizations with similar development levels than with different development levels. In addition, process boundary also takes place when organizations do not participate in the same business process. It is believed that organizations participating in the same business process are more likely to share information with one another than those that are not [6][15].

2.4 An Integrated Framework of Boundaries

Zheng et al. [6][15] proposes a two-dimensional and interactive framework to give a comprehensive illustration of the boundaries in cross-boundary information sharing and integration (see Figure 1). When recent research seems to show that boundaries of the vertical dimension are less complex than those of the horizontal dimension [4][14][16], Zheng et al. claims that boundaries of the vertical and horizontal dimensions are equally important and can exist simultaneously. For instance, in terms of organizational boundary between government agencies, to cross a hierarchical boundary of the vertical dimension is not always easier than to cross a departmental boundary of the horizontal dimension as some researchers have suggested [6][15].

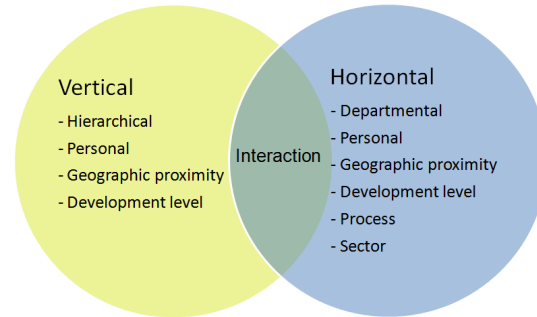


Figure 1. A framework of boundaries in cross-boundary information sharing and integration

While most information-sharing related literature is developed in the context of Western countries, and Zheng et al.'s [6][15] research is based on a case study in Mainland China, the following research questions are proposed for the study:

- 1) What are the boundaries of cross-boundary information sharing and integration in the other contexts of e-Government
- 2) Can the proposed framework of boundaries be applied to the other contexts of e-Government?
- 3) Whether the vertical boundaries can be less complex to cross than the horizontal boundaries in the other contexts of e-Government?

3. RESEARCH DESIGN AND METHOD

This study adopts a case study methodology to conduct the research. The focus case in the study is selected from the context of Taiwan e-Government. In particular, a single case study of the e-Networking Project of Government Online Service in Taiwan is developed and then used in the research. This project was a sub-plan of the Challenge 2008- Taiwan National Development Plan proposed by the Cabinet of Taiwan in 2002, and the duration of the project was from 2002 to 2007.

Qualitative data are collected through semi-structured interviews with the key actors from central and local government who participated in the related initiatives. A purposive sampling by using snowball sampling methodology is adopted to identify relevant interviewees. There were total twenty-eight participants interviewed, and the average duration of the interviews is about one hour and thirty minutes.

The interview data are transcribed and analyzed using a grounded theory approach to identify theoretical patterns and frameworks. In addition, government documentation and reports, and related reports and documents from newspapers and non-governmental organizations are also collected and used for the purpose of data analysis.

4. THE CASE STUDY

Taiwan has started developing its e-Government since 1997. In the past decade, Taiwan e-Government has focused effort on developing initiatives of cross-boundary information sharing and integration. The case of interest in the study, the e-Networking Project of Government Online Service, was started as a follow-up

project to continue promoting cross-boundary information sharing and integration when information systems were built across the government agencies of Taiwan.

The goal of the project is to provide integrated and efficient services to the public, private firms, public organizations, and also government agencies through cross-boundary information sharing and integration across several major information systems with other government agencies. The major information systems include Household Registration Information System (HRIS), Land Administration Information System (LAIS), Financial Taxation Information System (FTIS), Commerce Information System (CIS), and Motor Vehicle & Driver Information System (MVDIS). The five systems are the backbone information systems and the foundation of Taiwan e-Government. Most government agencies of Taiwan have to acquire information periodically from the five major information systems to run their daily operations. In addition to strengthening information sharing and integration across the vertical boundaries of government agencies, the Taiwan government endeavors most of its effort to promote information sharing and integration across the horizontal boundaries.

5. THE IDENTIFIED BOUNDARIES

Based on Zheng et al.'s [6][19] framework of boundaries, different boundaries of cross-boundary information sharing in the case study are presented and illustrated from both the vertical and the horizontal dimensions in the following subsections.

5.1 The Vertical Dimension

In the vertical dimension, flows of cross-boundary information sharing are passed down or up vertically among government agencies. The vertical dimension usually involves the interaction between central government agencies and local government agencies.

5.1.1 The Hierarchical Boundary

In the Household Registration Information System (HRIS), there are three levels of government agencies involving in cross-boundary information sharing and integration. The Department of Household Registration (DHR) is the central government agency under Ministry of the Interior. The Department of Civil Affairs (DCA) and the Household Registration Offices (HRO) are the local government agencies under County Government. There is a hierarchical boundary between the DHR and the DCAs, and the relationship between the government agencies of the two levels is indirect in administration but direct in cross-boundary information sharing. The HROs are the township government agencies to obtain household information directly from the public. The obtained household information is shared to the DCAs in the county government level. Then the DCAs further share the information to the DHR in the central government level.

5.1.2 The Process Boundary

A process boundary can exist between government agencies in the vertical dimension when they do not have their business processes connected. In the case study, if other central government agencies would like to have information sharing from the local government agencies of the five major information systems, they would have to contact the responsible central government agencies of the five major information systems rather than the local government

agencies. However, if a central government agency would like to have information sharing from other local government agencies outside of the five major information systems, a process boundary in the vertical dimension can appear if the central government agency does not have connected business process with the local government agencies.

5.1.3 The Geographic Boundary

When a central government agency has information-sharing activities with other local government agencies, a geographic boundary naturally exists between the two government agencies. A geographic boundary can have properties such as physical distance, geographic terrain, and time zone. For a central government agency, some local government agencies may be located just a few blocks or miles away, but some may be located in remote areas that are not easy to reach. In the case study, each of the five major information systems all include a responsible central government agency and local government agencies located in different counties, and geographic boundaries exist among them.

5.1.4 The Development Level Boundary

The informatization asymmetry can be an example to represent the development level boundary. In the case study, central government agencies and local government agencies located in metropolitan areas have better funding and resources to develop their information infrastructure than do other remote local government agencies. A development level boundary in informatization asymmetry between a central government agency and a remote local government agency is gradually formed and broadened. In addition, it is also a fact that some local government agencies located in large cities such as Taipei and Kaoshiung have more advanced development in their information infrastructure than do central government agencies. Therefore, a reverse informatization asymmetry could appear.

5.1.5 The Personal Boundary

In addition to the aforementioned four boundaries formed by the organizational structures, the geographic locations, and the development divides, there is also a naturally personal boundary existing in the vertical dimension of cross-boundary information sharing. A personal boundary can appear between a central government agency and a local government agency when they communicate and negotiate an initiative of cross-boundary information sharing. A personal boundary can exist between the representative personnel involving in the initiative. A personal boundary is naturally formed because of different participating individuals and their standpoints to represent different government agencies. Therefore, individual characteristics, communication skills, and personal involvement are important influential factors when it comes to cross a personal boundary.

In sum, the five identified boundaries in the vertical dimension are the hierarchical boundary, the process boundary, the geographic boundary, the development level boundary, and the personal boundary.

5.2 The Horizontal Dimension

In the horizontal dimension, flows of cross-boundary information sharing are passed horizontally among parallel government

agencies at the same level. The following subsections discuss the horizontal boundaries.

5.2.1 The Departmental Boundary

A departmental boundary is defined as a boundary formed by governmental structure. The boundary can occur between two parallel government agencies at the same level.

In the central government level, an intra-ministry departmental boundary can exist between two government agencies of the same ministry. For instance, the Department of Land Administration needs to have information sharing from the Department of Household Registration for identity confirmation of land administration. The two government agencies are both under Ministry of the Interior. A departmental boundary can be further extended to the government agencies across different ministries. For instance, to achieve the efficiency and accuracy in its taxation business, the Financial Data Center requires information sharing from the Department of Household Registration. The two central government agencies are belonged to two different ministries, and there is an inter-ministry departmental boundary between them. Therefore a departmental boundary can exist in both the intra-ministry level and the inter-ministry level. In this case study, a departmental boundary in the inter-ministry level is believed to be more difficult to cross because of the increasing number of barriers surrounding the boundary.

In the local government level, there is also a departmental boundary between parallel local government agencies. For instance, if a Local Tax Bureau can not reach a certain taxpayer by using its own information, the agency has to contact the Department of Civil Affairs in its county to acquire updated contact information to reach the taxpayer. The flow of information sharing is horizontal between the two parallel local government agencies at the same level.

However, in this case study, a departmental boundary of cross-boundary information sharing between two local government agencies of two different counties may not exist. In this case study, the five major information systems are designed, deployed, and maintained in centralized structure. If the Local Tax Bureau of local government B needs to retrieve information from the Department of Civil Affairs of local government A, the local government agency has to go up to the central government level by having the Financial Data Center act as an intermediary to contact the Department of Household Registration to acquire the information it needs rather than to directly contact the local agency of local government A. The approach is to eliminate as many departmental boundaries as possible by utilizing the centralized information systems. Otherwise, the number of departmental boundary for a local government agency may increase drastically, and the challenge to cross any of the departmental boundaries can vary from one another.

5.2.2 The Process Boundary

In the horizontal dimension, a process boundary appears when two government agencies at the same level do not have connected business process. For instance, the Department of Land Administration focuses on land administration, and the Financial Data Center concentrates on taxation business. There is no connecting core business process between the two central

government agencies. However, the Financial Data Center needs information sharing from the Department of Land Administration because it believes the land information from the Department of Land Administration is more thorough and accurate to help to increase taxation revenue. In the situation, there is a process boundary existing between the two central government agencies. The situation also applies to local government agencies at the same county. However, in this case study, the Local Tax Bureau of local government A can not have direct information sharing from the Department of Land Administration of local government B. Because of the centralized information systems, the information sharing between the two local government agencies of the different counties is required to go through their responsible central government agencies.

5.2.3 The Geographic Boundary

A geographic boundary also exists among parallel government agencies at the same level. As aforementioned in subsection 5.1.3, a geographic boundary is a naturally formed boundary having properties such as physical distance, geographic terrain, and time zone. In this case study, the geographic boundary in the horizontal dimension is narrower because of the small territory of Taiwan. In the central government level, almost all central government agencies are located in the capital area. Therefore, the geographic boundaries among the central government agencies exist but with very narrow gaps. In the local government level, although there are counties located in remote islands, local government agencies of the same county are also located closely. Similarly, because of the five centralized information systems, a geographic boundary of cross-boundary information sharing may not exist between local government agencies of different counties.

5.2.4 The Development Level Boundary

A development level boundary does not just exist vertically between a central government agency and a local government agency. It also exists horizontally between government agencies at the same level. Parallel government agencies at the same level can have different budgets and resources, and their progresses in informatization vary from each other. For instance, both the Department of Household Registration and the Department of Land Administration have similar development level in informatization and the flows of information sharing between the two central government agencies are fluent. On the other hand, some juridical agencies in central government level have very limited development in informatization. The flows of information sharing between the juridical agencies and other central government agencies can be more limited and less fluent. Similarly, a development boundary can also occur between two local government agencies at the same level. However, a development level boundary between two local government agencies of different counties may not exist because of the five centralized information systems.

5.2.5 The Personal Boundary

A personal boundary in the horizontal dimension forms between representative personnel of government agencies at the same level. The interaction and relationship of personnel and leaders of government agencies matter to cross-boundary information sharing especially for government agencies at the same level. For instance, if the leaders of two government agencies have poor

personal relationship, the personal boundary is inevitably broadened, and information sharing between the two government agencies could be more difficult and even be terminated. A personal boundary formed between two parallel government agencies at the same level could be broader than that formed between two hierarchical government agencies having a supervisor-subordinate relationship. Similarly, because of the five centralized information systems, a personal boundary may not exist between two local government agencies of different counties.

5.2.6 The Sectoral Boundary

In addition to the aforementioned five boundaries in the horizontal dimension between government agencies, there is also a sectoral boundary existing between government agencies and private enterprises or non-profit organizations. Nowadays, the interactions between the public sector and the private sector increase drastically. The flows of cross-boundary information sharing between the two sectors can be either one-directional or bi-directional. For instance, in order to help the small and medium companies to obtain bank loans, the Small and Medium Enterprise Administration (SMEA) acts as an intermediary to acquire company registration information from the Department of Commerce and taxation information from the Financial Data Center. Then SMEA share the information to banks to evaluate loan applications. The information can help banks to alleviate information asymmetry, and the chance for the small and medium companies to obtain bank loans can increase. In this example, a sectoral boundary exists between the SMEA in the public sector and banks in the private sector.

6. THE DISCUSSION AND CONCLUSION

6.1 The Boundary Framework is Generalizable

By using Zheng et al.'s framework of boundaries, boundaries of the information sharing and integration in both the vertical dimension and the horizontal dimension are discussed and illustrated in the previous sections. The five identified boundaries in the vertical dimension are the hierarchical boundary, the process boundary, the geographic boundary, the development level boundary, and the personal boundary. The four boundaries in the vertical dimension of Zheng et al.'s framework of boundaries are all identified in the case study. In addition, although the process boundary in the vertical dimension is not in Zheng et al.'s framework of boundaries, it is identified in the case study, and the framework can be extended.

In the horizontal dimension, there are six boundaries identified. The six boundaries are the departmental boundary, the process boundary, the geographic boundary, the development level boundary, the personal boundary, and the sectoral boundary. All the boundaries in the horizontal dimension of Zheng et al.'s framework of boundaries are identified in the case study.

The result of the boundaries identification in the case study can be the verification that Zheng et al.'s integrated framework of boundaries in cross-boundary information sharing can be generalizable in the different contexts of e-Government.

6.2 Centralized Information Systems to Remove Boundaries

In the case study, the five major information systems are built to connect central government agencies and local government agencies having the same core businesses. The centralized information systems eliminate the boundaries in the horizontal dimension between local government agencies of different counties if their information sharing is within the scope of the centralized information systems. The information sharing between local government agencies of different counties is required to go up to the central government level by having the responsible central government agencies act as intermediaries. On the other hand, local government agencies of the same county have autonomy and can directly share information to each other. Therefore, there are also horizontal boundaries existing between local government agencies of the same county.

In the case study, the centralized information systems not only decrease the horizontal boundaries between local government agencies of different counties, but also reduce the vertical boundaries between central government agencies and local government agencies when they do not have connected core businesses and are within the scope of the centralized information systems. There are respective single windows in the central government level for each centralized information system to resolve needs of cross-boundary information sharing.

6.3 Vertical Boundaries Are Not Easier To Cross Than Horizontal Boundaries

However, it does not assume that boundaries in the vertical dimension are easier to cross than do boundaries in the horizontal dimension. Outside the scope of the five centralized information systems, it is another story for a central government agency to acquire information from local government agencies when they have no connected business process. A central government agency will have to interact with one local government agency by one local government agency.

For instance, in the case study, because of the established Household Registration Information System, the Bureau of Labor Insurance (BLI) can have information sharing directly from the Department of Household Registration (DHR) to acquire household information of all twenty-five counties of Taiwan. The boundaries that the BLI needs to cross are just the horizontal boundaries between it and the DHR. However, when the BLI needs to have social welfare information sharing from the Department of Social Affairs (DSA) of each local government, the BLI has to deal with one local government agency by one local government agency because there is no centralized social welfare information system. There are five boundaries identified in the vertical dimension in the case study. Therefore, when the BLI needs to interact with twenty-five local government agencies, there will be one hundred and twenty-five boundaries in the vertical dimension that the BLI has to cross to fulfill its information-sharing need. In this example, crossing vertical boundaries is believed to be more complex than crossing horizontal boundaries.

6.4 Conclusion

In sum, a government agency usually has to deal with different government agencies to have cross-boundary information sharing to run its operations or to make its operations more efficient in innovative ways. A government agency inevitably encounters different vertical and horizontal boundaries simultaneously, and the boundaries also interact to each other. By adopting Zheng et al.'s framework of boundaries, the discussion of the various boundaries in this paper can provide a more thorough lens to understand the complexity of cross-boundary information sharing and integration. Zheng et al.'s framework of boundaries is also proved to be a useful analytical tool to perceive various vertical and horizontal boundaries in the different contexts of e-Government. In the case study, a new process boundary in the vertical dimension is identified. In addition, centralized information systems in the case study are helpful to remove some of the boundaries. Furthermore, it is verified in the case study that vertical boundaries are not always easier to cross than horizontal boundaries.

For the future studies, it will be interesting to further apply the framework of boundaries to other contexts of e-Government, to explore the unidentified boundaries, and to see how other contexts of e-Government interact with the boundaries in their initiatives of cross-boundary information sharing and integration.

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